

AMENDMENTS TO THE CLAIMS

Listing of Claims:

This listing of claims will replace all prior versions, and listings, of claims in the application:

1. (Previously Presented) A method for bonding a surface of a fibrous substrate article to a surface of a second substrate article, wherein the second substrate article comprises an elastomer substrate article, an engineering plastic substrate article, a metal substrate article, or a fiber-reinforced composite substrate article, to form a composite structure, comprising the steps of:

(a) providing a catalyst at the fibrous substrate article surface;

(b) contacting the catalyst on the fibrous substrate article surface with a metathesizable material so that the metathesizable material undergoes a metathesis reaction; and

(c) contacting the fibrous substrate article surface including the metathesizable material with a second substrate article surface whereby bonding between said articles occurs by curing of the metathesizable material therebetween.

2. (Previously Presented) The method according to claim 1, wherein the fibrous substrate article surface comprises polyester, polyethylene, polypropylene, carbon, polyamide nylon or aramid polyamide.

3. (Previously Presented) The method according to claim 2, wherein the second substrate article comprises an elastomeric substrate article.

4. (Previously Presented) The method according to claim 3, wherein the elastomeric substrate article is natural rubber, polychloroprene, polybutadiene, polyisoprene, styrene-butadiene copolymer rubber, acrylonitrile-butadiene copolymer rubber, ethylene-propylene copolymer rubber, ethylene-

propylene-diene terpolymer rubber, butyl rubber, brominated butyl rubber, alkylated chlorosulfonated polyethylene rubber, hydrogenated nitrile rubber, poly(n-butyl acrylate), thermoplastic elastomer or mixtures thereof.

5. (Previously Presented) The method according to claim 3, wherein the elastomeric substrate article is natural rubber or ethylene-propylene-diene terpolymer rubber.

6. (Withdrawn) The method according to claim 1, where step (a) comprises soaking the fibrous substrate article in a catalyst solution in a carrier, and removing the carrier, and step (b) comprises dipping the catalyst-soaked fibrous substrate article into a metathesizable material and allowing polymerization.

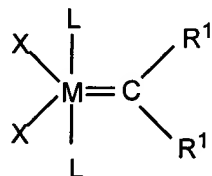
7. (Previously Presented) The method according to claim 1, wherein step (c) comprises placing the fibrous substrate article between two layers of second substrate article surface in a mold and curing the second substrate article with heat and pressure.

8. (Withdrawn) The method according to claim 1, wherein the catalyst is dissolved or mixed into a liquid carrier fluid.

9. (Previously Presented) The method according to claim 1, wherein the catalyst is included as a component of the fibrous substrate article.

10. (Previously Presented) The method according to claim 1, wherein the catalyst is a rhenium compound, ruthenium compound, osmium compound, molybdenum compound, tungsten compound, titanium compound, niobium compound, iridium compound or MgCl_2 , or a combination thereof.

11. (Previously Presented) The method according to claim 10, wherein the catalyst has a structure represented by



wherein M is OS, Ru or Ir; each R¹ is the same or different and is H, alkenyl, alkynyl, alkyl, aryl, alkaryl, aralkyl, carboxylate, alkoxy, allenylidenyl, indenyl, alkyl-alkenylcarboxy, alkenylalkoxy, alkenylaryl, alkynylalkoxy, aryloxy, alkoxycarbonyl, alkylthio, alkysulfonyl, alkylsulfinyl, amino or amido; X is the same or different and is either an anionic or a neutral ligand group; and L is the same or different and is a neutral electron donor group.

12. (Previously Presented) The method according to claim 11, wherein X is Cl, Br, I, F, CN, SCN, N₃, O-alkyl or O-aryl; L is a heterocyclic ring or Q(R²)_a, wherein Q is P, As, Sb or N; R² is H, cycloalkyl, alkyl, aryl, alkoxy, arylate, amino, alkylamino, arylamino, amido or a heterocyclic ring; and a is 1, 2 or 3; M is Ru; and R¹ is H, phenyl, -CH=C(phenyl)₂, -CH=C(CH₃)₂ or -C(CH₃)₂(phenyl).

13. (Previously Presented) The method according to claim 10, wherein the catalyst is a phosphine-substituted, an imidazolylidene-substituted, or a dihydro-imidazolylidene-substituted ruthenium carbene.

14. (Previously Presented) The method according to claim 13, wherein the catalyst is bis(tricyclohexylphosphine)benzylidene ruthenium (V) dichloride, tricyclohexylphosphine [1,3-bis(2,4,6-trimethylphenyl)-4,5-dihydroimidazol-2-ylidene] [benzylidene] ruthenium (IV) dichloride, or

tricyclohexylphosphine[1,3-bis(2,3,6-trimethyl-phenyl)-4,5-imidazol-2-ylidene][benzylidene]ruthenium (IV) dichloride.

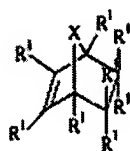
15. (Previously Presented) The method according to claim 1, wherein the catalyst is stable in the presence of moisture and oxygen and can initiate polymerization of the metathesizable material upon contact at room temperature.

16. (Previously Presented) The method according to claim 1, wherein the metathesizable material is ethane, α -alkene, acyclic alkene, acyclic diene, acetylene, cyclic alkene, cyclic polyene or mixtures thereof.

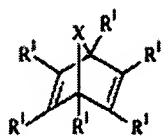
17. (Previously Presented) The method according to claim 16, wherein the metathesizable material comprises a cycloolefin cyclic alkene.

18. (Previously Presented) The method according to claim 17, wherein the metathesizable material is a monomer or oligomer of norbornene, cycloalkene, cycloalkadiene, cycloalkatriene, cycloalkatetraene, or aromatic-containing cycloolefin or mixtures thereof.

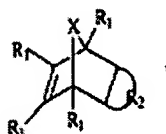
19. (Previously Presented) The method according to claim 18, wherein the metathesizable material has a structure represented by



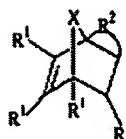
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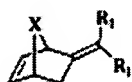
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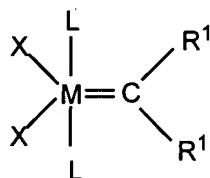
wherein X is CH_2 , CHR^3 , $\text{C}(\text{R}^3)_2$, O, S, N-R^3 , P-R^3 , O=P-R^3 , $\text{Si}(\text{R}^3)_2$, B-R^3 or As-R^3 ; each R^1 is independently H, CH_2 , alkyl, alkenyl, cycloalkyl, cycloalkenyl, aryl, alkaryl, aralkyl, halogen, halogenated alkyl, halogenated alkenyl, alkoxy, oxyalkyl, carboxyl, carbonyl, amido, (meth)acrylate-containing group, anhydride-containing group, thioalkoxy, sulfoxide, nitro, hydroxy, keto, carbamato, sulfonyl, sulfonyl, carboxylate, silanyl, cyano or imido; R^2 is a fused aromatic, aliphatic or heterocyclic or polycyclic ring; and R^3 is alkyl, alkenyl, cycloalkyl, cycloalkenyl, aryl, alkaryl, aralkyl or alkoxy.

20. (Previously Presented) The method according to claim 17, wherein the metathesizable material comprises ethylenenorbornene monomer or oligomer, dicyclopentadiene or bicycle[2.2.1]hept-5-en-2-yl-trichlorosilane.

21. (Currently Amended) The method for bonding a fibrous substrate article to an elastomeric substrate article comprising the steps of:

- (a) providing a catalyst on a surface on the fibrous substrate article;
- (b) contacting the catalyst on the fibrous substrate article with a metathesizable material so that the metathesizable material undergoes a metathesis reaction;
- (c) contacting the fibrous substrate article comprising the methathesizable material with the elastomeric substrate article to form a composite material; and
- (d) curing said composite material to bond said fibrous substrate comprising the metathesizable material to said elastomeric substrate.

22. (Previously Presented) The method according to claim 21, wherein the catalyst has a structure represented by



wherein M is OS, Ru or Ir; each R¹ is the same or different and is H, alkenyl, alkynyl, alkyl, aryl, alkaryl, aralkyl, carboxylate, alkoxy, allenylidenyl, indenyl, alkyl-alkenylcarboxy, alkenylalkoxy, alkenylaryl, alkynylalkoxy, aryloxy, alkoxycarbonyl, alkylthio, alkylsulfonyl, alkylsulfinyl, amino or amido; X is the same or different and is either an anionic or a neutral ligand group; and L is the same or different and is a neutral electron donor group.

23. (Previously Presented) The method according to claim 22, wherein X is Cl, Br, I, F, CN, SCN, N₃, O-alkyl or O-aryl; L is a heterocyclic ring or

$Q(R^2)_a$, wherein Q is P, As, Sb or N; R^2 is H, cycloalkyl, alkyl, aryl, alkoxy, arylate, amino, alkylamino, arylamino, amido or a heterocyclic ring; and a is 1, 2 or 3; M is Ru; and R^1 is H, phenyl, $-\text{CH}=\text{C}(\text{phenyl})_2$, $-\text{CH}=\text{C}(\text{CH}_3)_2$ or $-\text{C}(\text{CH}_3)_2(\text{phenyl})$.

24. (Previously Presented) The method according to claim 21, wherein the catalyst is a phosphine-substituted, an imidazolylidene-substituted, or a dihydro-imidazolylidene-substituted ruthenium carbene.

25. (Previously Presented) The method according to claim 24, wherein the catalyst is bis(tricyclohexylphosphine)benzylidene ruthenium (V) dichloride, tricyclohexylphosphine[1,3-bis(2,4,6-trimethylphenyl)-4,5-dihydroimidazol-2-ylidene] [benzylidene] ruthenium (IV) dichloride, or tricyclohexylphosphine[1,3-bis(2,3,6-trimethyl-phenyl)-4,5-imidazol-2-ylidene][benzylidene]ruthenium (IV) dichloride.

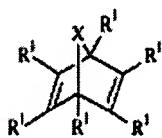
26. (Previously Presented) The method according to claim 21, wherein the metathesizable material comprises a cycloolefin.

27. (Previously Presented) The method according to claim 26, wherein the metathesizable material is a monomer or oligomer of norbornene, cycloalkene, cycloalkadiene, cycloalkatriene, cycloalkatetraene, aromatic-containing cycloolefin or mixtures thereof.

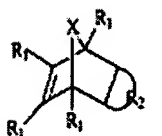
28. (Previously Presented) The method according to claim 27, wherein the metathesizable material comprises a norbornene having a structure represented by



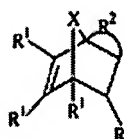
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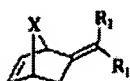
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or



wherein X is CH₂, CHR³, C(R³)₂, O, S, N-R³, P-R³, O=P-R³, Si(R³)₂, B-R³ or As-R³; each R¹ is independently H, CH₂, alkyl, alkenyl, cycloalkyl, cycloalkenyl, aryl, alkaryl, aralkyl, halogen, halogenated alkyl, halogenated alkenyl, alkoxy, oxyalkyl, carboxyl, carbonyl, amido, (meth)acrylate-containing group, anhydride-containing group, thioalkoxy, sulfoxide, nitro, hydroxy, keto, carbamato, sulfonyl, sulfonyl, carboxylate, silanyl, cyano or imido; R² is a fused aromatic, aliphatic or heterocyclic or polycyclic ring; and R³ is alkyl, alkenyl, cycloalkyl, cycloalkenyl, aryl, alkaryl, aralkyl or alkoxy.

29. (Previously Presented) The method according to claim 26, wherein the metathesizable material comprises ethylenenorbornene monomer or oligomer, dicyclopentadiene or bicycle[2.2.1]hept-5-en-2-yl-trichlorosilane.

30. (Previously Presented) The method according to claim 21, wherein the fibrous substrate article is polyester, polyethylene, polypropylene, carbon, polyamide nylon or aramid polyamide.

31. (Previously Presented) The method according to claim 30, wherein the elastomeric substrate article is natural rubber, polychloroprene, polybutadiene, polyisoprene, styrene-butadiene copolymer rubber, acrylonitrile-butadiene copolymer rubber, ethylene-propylene copolymer rubber, ethylene-propylene-diene terpolymer rubber, butyl rubber, brominated butyl rubber, alkylated chlorosulfonated polyethylene rubber, hydrogenated nitrile rubber, poly(n-butyl acrylate), thermoplastic elastomer or mixtures thereof.

32. (Previously Presented) The method according to claim 21, wherein the elastomeric substrate article is natural rubber or ethylene-propylene-diene terpolymer rubber.

33. (Previously Presented) The method according to claim 21, wherein steps (a) and (b) take place at room temperature.

34-48 (Canceled)

49. (Previously Presented) The method according to claim 21, wherein said fibrous substrate article is a reinforcing cord and said elastomeric substrate article is an elastomer flowed through the reinforcing cord and cured to form a tire, belt or hose.

50. (Previously Presented) The method according to claim 1, wherein said fibrous substrate article is a reinforcing cord and said second substrate article is a post-vulcanized or cured elastomer.